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June 29, 1994

HAND DELIVER

Mr. William F. Caton
Acting Secretary
Federal Communications, Commission
1919 M Street, N.W.
Washington, DC 20554

Dear Mr. Caton:

On behalf of Capital Cities/ABC, Inc., transmitted herewith for filing with the Commission are an original and five copies of its Reply Comments in ET Docket No. 94-32.

If the Commission has any questions about these comments, please contact me.

Respectfully,

Dvora Wolff Rabino

Dvora Wolff Rabino

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Fax (212) 456 6202

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of Allocation of Spectrum Below 5 GHz Transferred From Government Use	)))	ET Docket No. 94-32

REPLY COMMENTS OF CAPITAL CITIES/ABC, INC.

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June 29, 1994

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of Allocation of Spectrum Below 5 GH$_z$ Transferred From Government Use	)))	ET Docket No. 94-32

To: The Commission

REPLY COMMENTS OF CAPITAL CITIES/ABC, INC.

Capital Cities/ABC, Inc. ("Capital Cities/ABC") submits these Reply Comments in support of the Comments of the Association for Maximum Service Television, Inc. ("MSTV") dated June 15, 1994.

In its comments, MSTV has requested that the slice of spectrum at 4660-4685 MH$_z$, which is proposed to be freed up for private sector use by the government sector, should be allocated for broadcast auxiliary use and specifically for wideband advanced digital video services ("ATV"). MSTV argues that the existing broadcast auxiliary bands are unlikely to be able to support advanced video services, such

as high-definition television and multiple-picture or simultaneous-picture television. We concur in MSTV's comments for the following reasons.

To achieve the level of picture resolution that is theoretically made possible by ATV, it will be necessary to relay detailed ATV picture signals from ATV cameras located at the site at which the pictures are taken to a studio and then to a transmitter for transmission to the public. The current broadcast auxiliary spectrum is already overly congested, as documented by Capital Cities/ABC in a variety of prior comments. This congested spectrum cannot support the additional signal paths that broadcasters would need for ATV, for at least four reasons, which are described in greater detail in the attached Engineering Statement of Kenneth J. Brown.

First, the radio frequency spectrum currently allocated to video broadcast auxiliary services is often insufficient even to meet broadcasters' existing needs. For example, the ABC Television Network often experiences difficulties in obtaining sufficient "signal paths" to relay visual information from our cameras to our facilities for distribution to our affiliated stations. Local broadcasters have priority over networks for the limited spectrum available for such signal paths, and there are often too few

channels left for the networks to cover events of national and regional interest. Capital Cities/ABC frequently has to borrow spectrum from non-broadcast users to meet its current needs. The possibilities for such borrowing are severely limited by the existing uses of the spectrum and by technical requirements.

Second, several frequency bands historically used by Capital Cities/ABC on a Special Temporary Authority ("STA") or grandfathered basis will soon cease to be available to us because of reallocations to other services.

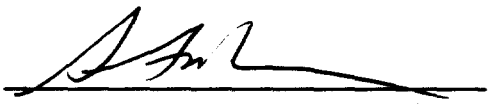
Third, the Commission has recently reallocated the PCS band to include spectrum directly adjacent to the lower band edge of vital broadcast auxiliary spectrum. This PCS reallocation may very likely render unusable one or two of our existing channels due to anticipated receiver overload conditions.

Finally, allowing television viewers to select among multiple camera angles of an event, as ATV could theoretically accomplish, will be impossible without the radio frequencies necessary to forward the extra camera angles from mobile studios at the event to network and station studios for transmittal to viewers.

Conclusion

For the reasons set forth above, Capital Cities/ABC urges that the Commission grant MSTV's request that the 4660-4685 MH_z spectrum be allocated for broadcast auxiliary ATV use.

Respectfully submitted,

By: 

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June 29, 1994

ABC Broadcast Operations & Engineering 47 West 66 Street New York NY 10023 (212) ~~887~~ 7777

ENGINEERING STATEMENT OF KENNETH J. BROWN IN CONNECTION WITH REPLY COMMENTS OF CAPITAL CITIES/ABC, INC. SPECTRUM BELOW 5 GHZ TRANSFERRED FROM GOVERNMENT USE ET DOCKET 94-32

I am Manager of Allocations and Licensing for the American Broadcasting Companies, Inc., a wholly-owned subsidiary of Capital Cities/ABC, Inc., with offices located in New York City. My education and experience are a matter of record with the Federal Communications Commission.

This statement has been prepared for filing in connection with the Reply Comments of Capital Cities/ABC, Inc. (ABC) in response to the FCC's Notice of Inquiry into the allocation of spectrum transferred from government to private sector use.

We concur in the request of Association for Maximum Service Television (MSTV) that the slice of spectrum at 4660-4685 MHz, which is proposed to be freed up for private sector use by the government sector, should be allocated for broadcast auxiliary use and specifically for wideband advanced digital video services.

As MSTV argues, the existing broadcast auxiliary bands are already congested and unlikely to be able to support advanced video services as well. There are severe limitations on Broadcast Auxiliary spectrum necessary to get pictures from a venue of interest to a studio and from there to a transmitter for transmission to the public.

We are well aware of the congestion problems suffered in current broadcast auxiliary spectrum. As a network, our itinerant operations are usually secondary to existing local broadcast operations in each city and location from which we attempt a nationwide network broadcast. We frequently have to go to extreme lengths to borrow spectrum to provide the video services our viewers have come to expect. ABC filed lengthy Comments (June 5, 1992) and Reply Comments (July 8, 1992) in ET Docket 92-9, which discussed some of the specific uses of broadcast auxiliary spectrum, including many uses virtually unique to major network productions, and some of the problems experienced in relay of real-time video under field conditions. We also contributed to a paper concerning the characteristics of existing terrestrial mobile 2 GHz video operations and the impact of increasing congestion on space operations (Document USTG 7-1/101, copy attached) which became a United States contribution (renumbered as Doc. 7-1/12-E) to the international meeting of TG 7/1 in Geneva in November 1993. Extracts from this paper became Annex 3 of the Draft New Recommendation for guidance on terrestrial mobile systems sharing spectrum with

space research, space operations, and earth-exploration satellite services in the 2025-2110 MHz band, which Draft New Recommendation was referred to Study Group 7 for consideration at its meeting in March of this year.

In addition to the facts discussed in these documents, several other circumstances, which will be discussed in the four numbered paragraphs below, have become relevant to what now appears to be the impossibility of ever doing ATV without additional "backstage" spectrum. Firstly, our requirements already exceed our allocated spectrum, and have for some time. Secondly, spectrum which we have been able to borrow from other users will soon become unavailable to us, forcing a reduction in services we can provide and thus, very likely, in their value, both domestically and as marketed overseas. Thirdly, proposed actions now before the FCC may further reduce our spectrum capacity by rendering existing spectrum unusable. Fourthly, ATV proposals such as allowing viewer selection of camera angles, as advocated by former FCC Chairman Sikes, would require additional relay capacity beyond current requirements. While propagation differences between the proposed additional spectrum and the existing heavily-used 2 GHz band will prevent the one from ever replacing the other, the new spectrum could fill some of the new requirements of ATV.

1. Live television pictures of events of interest to the public require real-time transmission of signals from cameras. When the cameras must move significantly to cover the event, fiber and other types of cabling are useless; radio frequency (RF) must be used. Moving cameras at an event of special national or regional interest require RF signal paths additional to the regular RF paths needed by local broadcasters to cover news and special events and to get signals to their transmitter sites. Sometimes regular signal paths are not needed in service at the time of the special event and may be "borrowed" through the process of broadcast auxiliary frequency coordination. As often, particularly now that so much spectrum usage by local broadcast stations occurs on a regular basis, there is already so much time-sharing of microwave channels that sufficient channels cannot be freed-up by locals to meet network requirements. This is particularly the case when a major network production calls for numerous moving cameras to be operated. For some years, ABC has found it necessary to borrow spectrum on Special Temporary Authority (STA) basis from non-broadcast users to meet our needs. The frequencies which may be borrowed are limited to those whose propagation and available bandwidth characteristics match our requirements, which are "clean" enough from interference that low-power highly portable transmitters may be used, and whose users are able to

release them to us without detriment to themselves during the particular time window and at the location where we need the spectrum. There are not many possibilities. The Commission's files contain numerous examples of STA requests we have filed over the past years. This year, we have been relying upon an experimental STA (KO2XDO) obtained by a service vendor, Broadcast Sports Technology, to fulfill most of the authorization requirements; but the coordination constraints remain as difficult as ever.

2. Several of the frequency bands in which we now operate, or which we have been frequently able to borrow at certain locations and times in the past, will cease to be available to us. For example, we hold licenses for three video microwave channels in 2450-2500 MHz, which we use regularly, despite the constraints of sharing this spectrum with Industrial, Scientific, and Medical (ISM) and other services. In GEN Docket 84-689, Report and Order FCC 85-388, the 2483.5-2500 MHz portion of this spectrum was reallocated to Radiodetermination Satellite Service, though existing licensees were grandfathered in conditional continued co-primary use of the channel (see par. 15-16 and 18-19). Now that mobile satellite has expressed interest in that spectrum, we could lose our use of this channel in the near future. Spectrum from 2310-2390 MHz, which we currently are able to borrow on an occasional basis from the Flight Test community, has been largely reallocated (2310-2360 MHz) to digital radio, which will render it unusable to us. And even within our own spectrum, there have already been interference problems from attempting to utilize the 6875-7125 MHz band, which is heavily used for fixed point-to-point signals, for mobile and temporary fixed uses as well.

3. The new Memorandum Opinion and Order FCC 94-144 in GEN Docket 90-314, in reallocating the PCS band to include spectrum directly adjacent to the lower band edge of our spectrum, together with the drastic increase in Effective Radiated Power, may very well, depending on how the spectrum is used, render our lower channels useless to us due to receiver overload. Although the Commission states (par. 191) that out-of-band emission "limits are sufficient to protect microwave operations in adjacent bands", the technology does not now exist and is not predicted to exist to permit creation of a filter which will protect a sensitive receiver at a fixed site from being overloaded by a nearby high power adjacent channel signal, without a guard band. If no adequate guard band is provided, then the spectrum is rendered unusable. Since congestion is such that we have already been operating under some circumstances in "split-channel" mode, as documented in our previous comments, this latest reallocation could cost us at

least one and possibly two channels, which we simply cannot spare.

4. Former FCC Chairman Al Sikes advocated the possibility of advanced television systems providing multiple camera angles of an event to the viewer, allowing the viewer, in effect, to direct his own viewing of the event. It must be realized that these extra camera angles are usually not now forwarded to the station studios, but rather are pre-selected at mobile studios located at the event. To transmit even a small portion of the on-site camera angles available at a major field event through to the viewer will require a multiplication of the relay spectrum currently available to us.

Very simply, if the Commission desires to support advanced television, the Commission should allocate spectrum for the new video microwave links which will be necessary for real-time ATV of any sort to become possible.

DATED: June 29, 1994

Kenneth J. Brown

RS Fact Sheet

Task Group 7/1
Document USTG 7-1/101

Date: 10 September 1993
Ref:

Document Title: Characteristics and Model of Electronic News Gathering Systems Operating in the 1 990 - 2 110 MHz Band

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Purpose/Objective. The purpose of this paper is to provide information about Electronic News Gathering (ENG) systems operating in the United States in the 1 990 - 2 110 MHz band that may be used for developing appropriate sharing criteria and models for sharing studies with the space research, space operations, and Earth exploration-satellite services.

Abstract. This paper discusses the characteristics and use of Electronic News Gathering (ENG) systems in the United States and develops a model of the operation of these systems. ENG systems are operated extensively throughout the United States by television operators, sharing frequency bands allocated to space research, space operations, and Earth exploration-satellite services. This paper presents information necessary for analyzing the compatibility between ENG and the space services.

The paper first discusses the characteristics of ENG systems as well as common scenarios and environments in which these systems operate. The paper then presents common transmitter and antenna characteristics, frequency spectrum usage, and basic time statistics of the operation of ENG systems. Finally, the paper discusses parameters necessary for modeling ENG systems and develops a model that may be used for potential interference analyses. The modeling of ENG systems requires further study.

Documents
Radiocommunication
Study Groups
Period 1990-1994

Document USTG 7-1/101
10 September 1993
Original: English

Subject: Doc. 7-1/TEMP/1(Rev.2)

United States of America

CHARACTERISTICS AND MODEL OF ELECTRONIC NEWS GATHERING SYSTEMS OPERATING IN THE 1 990 - 2 110 MHZ BAND

1. Introduction

This paper discusses the characteristics and use of Electronic News Gathering (ENG) systems in the United States and develops a model of the operation of these systems. ENG systems are operated extensively throughout the United States by television operators, sharing frequency bands allocated to space research, space operations, and Earth exploration-satellite services. This paper presents information necessary for analyzing the compatibility between ENG and the space services.

The paper first discusses the characteristics of ENG systems as well as common scenarios and environments in which these systems operate. The paper then presents common transmitter and antenna characteristics, frequency spectrum usage, and basic time statistics of the operation of ENG systems. Finally, the paper discusses parameters necessary for modeling ENG systems and develops a model that may be used for potential interference analyses. The modeling of ENG systems requires further study.

2. Characteristics/Description of ENG Systems

In the United States, broadcast and cable television operators require a variety of auxiliary services to support the basic television operation. Five major video auxiliary services--studio-transmitter links (STL), intercity relays (ICR), temporary fixed systems, van-mounted transportable ENG systems, and point-of-view systems--utilize a variety of frequency bands collectively known as the Broadcast Auxiliary Services (BAS) bands. The 1 990 - 2 110 MHz band, known as the 2 GHz BAS band, includes frequencies used by the fixed, mobile, space research, space operations, and Earth exploration-satellite services which are allocated in the 2 025 - 2 110 MHz band. The STL , ICR, and temporary fixed services are not discussed in this paper since they are operated in the fixed service in the United States.

ENG service includes both mobile point-of-view and transportable ENG systems that provide video from a variety of locations and activities. ENG systems are used for on-location coverage of news events or interviews and live-action video during sports or entertainment events. Because of the value of on-location video and the competitive market for television news in the United States, most local television stations in urban areas operate ENG systems. The transportable ENG systems, used for on-location coverage, are generally mounted in vans and operate in a stationary mode transmitting video to a fixed receive site. These systems provide mobility for news coverage throughout a geographic region.

Small, highly mobile point-of-view systems are used in various types of news and sports coverage. Small hand-held cameras with a backpack-mounted transmitter provide close-up views that are considered important for conveying a news or sports event. These systems are operated from mobile points such as highly mobile camera operators, motorcycles, or race cars. Certain events, such as marathon, bicycle, or automobile races, require relaying the video transmission to a helicopter, which then relays the signal to a fixed site. In addition, broadcasters also use miniature ENG cameras in unique situations, such as mounted on a skier, to relay point-of-view video.

3. ENG Services and Environments

ENG systems are used in a large number of situations and in many different environments. Table 1 presents characteristics of typical ENG services in the 2 GHz BAS band. This section describes two common situations.

a. Transportable. The transportable ENG systems described in the previous section are used for live or taped on-location video for news, sports, and entertainment broadcasts. The transportable ENG systems are generally mounted in vans and use transmitters operating around 10.8 dBW of power. These systems utilize directional antennas with 20 - 22 dBi gain mounted on top of a pneumatic mast of up to 15 meters in height. ENG systems may employ linear or circular polarization to provide additional interference protection from each other. Many ENG systems (probably 30 to 50%) transmit with up to 5 dB of transmission line loss.

   Transportable ENG systems transmit from a stationary point to a fixed receive site usually located on a tall building or tower at a local point of high elevation. The pneumatic masts are used to improve the link by avoiding unnecessary blockage from terrain and buildings. Because of this blockage, however, ENG systems must occasionally operate (10% of time in some urban regions) by using reflection off buildings (building bounce) to obtain a path to the receive site. In spite of the use of masts, ENG links may encounter up to 6 dB of attenuation due to foliage and 2-12 dB of attenuation due to building shadowing. In addition, terrain and buildings cause multipath problems that require careful attention to the position of both the transmit and receive antennas.

b. Point-of-View. Small light-weight microwave transmitters are used for mobile and close-up video situations since live pictures are desired and because video recorders are impractical due to size and ruggedness requirements. These transmitters usually operate with up to 5 dBW of power. These systems utilize essentially omni antennas with 0-3 dBi of gain and may also use linear or circular polarization.

   Point-of-view systems operate primarily during special events, which often occur on weekends. A special event such as the New York City Marathon requires the relaying of microwave signals from the event to a fixed site for broadcast. A small hand-held system used on a motorcycle to obtain video of runners, for example, relays a microwave signal to a helicopter which in turn relays the signal to fixed receive sites. These helicopter transmitters use up to 10.8 dBW of power and hemispherical antennas with up to 6-7 dBi of gain generally aimed downward at the Earth.

   A small point-of-view system usually operates instead of, rather than in addition to, a transportable ENG operation on the same channel. Point-of-view systems cannot usually operate simultaneously with transportable systems because the transportable systems cause excessive interference to the point-of-view receiver.

Type of Use	Transmitter Location	Transmit Power	Antenna Gain	Receiver Location
ENG transportable (van)	van mast	12 W	22 dBi	tower
Temporary fixed link	roof	12 W	25 dBi	roof
Convention	floor of convention hall	100 mW	0-5 dBi	hall rafters
Point-of-view (e.g., skier)	on body/helmet	100 mW	0 dBi	hillside or helicopter
Sports venues				
playing field	field	1 W	12 dBi	pressbox
golf course (system 1)	on golf course	3 W	16 dBi	tethered blimp
golf course (system 2)	on golf course	12 W	12 dBi	crane
Racecam	in car	3 W	7 dBi	helicopter
helicopter	relay helicopter	12 W	7 dBi	ground receive
Marathon				
motorcycle	motorcycle	3 W	7 dBi	helicopter
relay vehicle	pickup truck	12 W	12 dBi	helicopter
helicopter	relay helicopter	12 W	7 dBi	roof

Table 1. Typical 2 GHz ENG Services

4. Spectrum Use and Characteristics

The 1 990 - 2 110 MHz band is used as the primary ENG band because of favorable propagation characteristics. These include the lower levels of foliage attenuation than apply at higher frequencies and the ability to "building bounce" a signal to achieve a temporary link to a fixed receive site despite unavoidable path blockage.

The ENG frequency band is divided into seven channels each with 17 MHz except the first channel which is 18 MHz as shown in Figure 1. ENG systems are usually operated at the center of each channel, but the lower offset and upper offset channels are also used. Consequently, 21 carrier frequencies are possible, but all carrier frequencies cannot be used simultaneously. ENG systems may operate at the center channel, the lower offset channel, the higher offset channel, or the lower and higher offset channels simultaneously, depending on the need and adjacent channel use at any time. Since ENG systems are sensitive to interference, only one transmission per channel per receive site at a time is usually possible.

ENG systems use frequency modulation (FM) for transmitting video. The carrier is virtually never transmitted unmodulated by video raster. Unlike normal television programming, instances of black pictures are rarely transmitted by an ENG system because most deliberate uses of "fade to black" are done in studio rather than at the ENG vehicle.

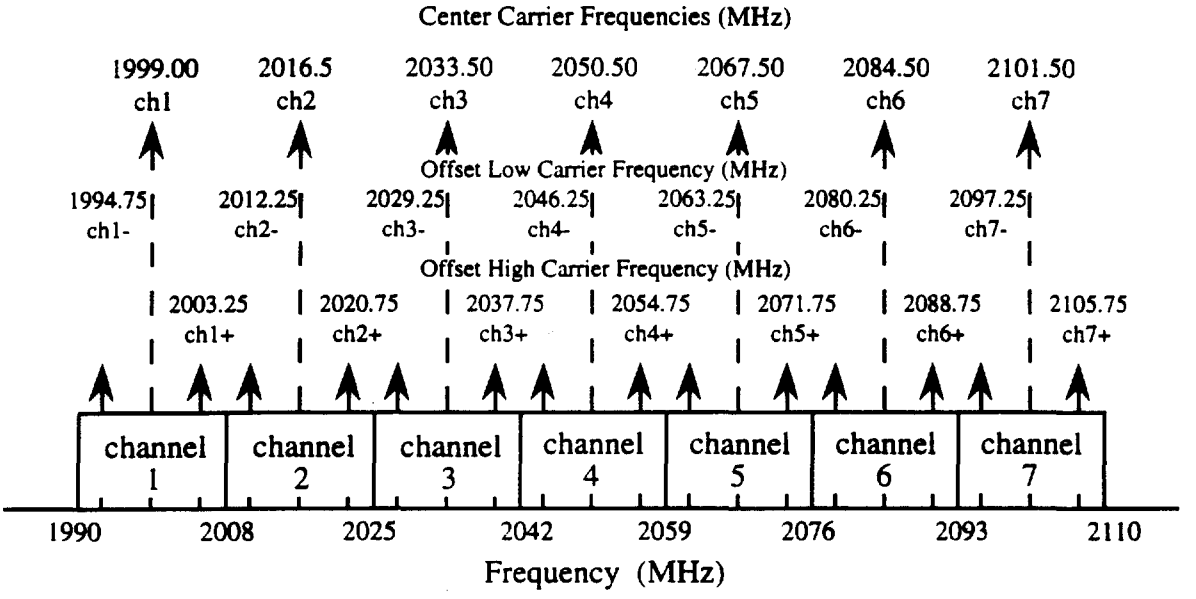

Figure 1. ENG Channel Plan

5. Operation

The most extensive regular ENG operations occur in large urban areas served by several television stations, each with their own news departments. However, due to limits on frequencies, time sharing of channels and other techniques for avoiding interference between stations are common. A 1989 survey of 350 broadcast television stations conducted by the National Association of Broadcasters (NAB) in the United States [1] indicates that 191 stations with an average number of 4.78 transmitters per station use the 1 990 - 2 110 MHz band for ENG services. The survey also revealed that many stations planned to purchase additional ENG systems. The estimated number of 2 GHz ENG systems currently operated by all television stations and cable operators in the United States exceeds 4000.

All ENG systems, however, cannot operate simultaneously. As stated in §4, only one transmission per channel per receive site at a time is usually possible. Most television markets in the United States contain multiple receive sites that allow for simultaneous transmissions on a channel. Multiple receive sites and terrain and building blockage allows for up to 15 simultaneous transmissions on one channel in Los Angeles--the most anywhere in the United States. In most large markets, however, only 6 simultaneous transmissions are possible on the busiest channel, and in most markets the number does not exceed two.

More than two simultaneous transmissions on a single channel rarely occur. In fact, multiple ENG receive sites and systems exist only in the largest television markets, so most regions have little or no simultaneous ENG activity per channel. Indeed, the number of commercial television stations equals or exceeds the number of channels in the 2 GHz band in only 51 of 209 television markets in the United States, making channel sharing unlikely. Broadcast engineers estimate that on average across the United States, about 300 ENG transmissions per channel occur during the peak evening news hour. Because of multiple time zones across the United States, the peak news hour does not occur everywhere simultaneously.

Although used throughout the day, transportable ENG systems operate primarily during weekday local news broadcasts, which usually occur around 1200-1230, 1700-1900, and 2300-2330 local time as indicated in [1]. In most markets before the afternoon news hours around 1500-1700, ENG use is also significant. The popularity of local morning shows from 0600-0900 is increasing in various markets, and these shows also use ENG services. In several markets, virtually an entire show is produced from the field using ENG services. According to the NAB survey [1] , transportable ENG transmitters are operated approximately twice per day. Broadcast engineers estimate that each ENG operation transmits an average of 15 minutes per operation but can vary from about 5 minutes to perhaps as long as 5 hours.

6. ENG Parameters and Time Operational Model

Using the characteristics and operation of ENG systems described in the previous sections, this section presents parameters necessary for modeling ENG systems and develops a model of ENG operation that may be used for potential interference studies. Although the model presented in this section considers technical, geographic, frequency, and time characteristics, this model of ENG operation does not fully account for the effects of time-of-day and signal attenuation from foliage and building shadowing.

The model presented in this section was developed for its simplicity and for its use in potential interference studies using a probability distribution of satellite location. Further study is required for refining the model of ENG operation to include the attenuation effects of foliage and building shadowing and the effects of local time-of-day.

a. Basic Parameters. The model for potential interference studies assumes that transportable ENG systems are the primary ENG interference source. Mobile ENG systems are considered as part of the aggregate model since they transmit with less power and less frequently. Table 2 presents the basic ENG parameters which may be used for potential interference studies. As shown in Table 1, higher ENG transmitter powers are associated with higher ENG antenna gain and lower ENG transmitter powers are associated with lower ENG antenna gain.

   Although transportable ENG systems transmit to fixed receive sites, ENG systems may operate from anywhere in a large metropolitan region. Thus, the antenna direction was assumed to be random in azimuth. ENG antennas point up to 90° in elevation but usually operate in lower elevation angles. The model assumes a probability density function shown in Table 2 for the elevation angle that approximates typical ENG use.

   Signals from ENG systems operating at low elevation angles encounter attenuation from foliage and building shadowing that is not accounted for in the current model. Further study is required to account for this attenuation.

   Missions of the space research service operating in the 2 025 - 2 110 MHz band usually operate with bandwidths of 6 MHz or less, which is less than the ENG channel bandwidth. Therefore, a low orbiting spacecraft of the space research service will usually be affected only by ENG systems operating in one channel of the ENG channel plan. The ENG channel bandwidth of 17 MHz is used as the ENG system bandwidth.

b. Time Operational Model. The number of ENG systems operating in a given channel varies during a typical day. The time operational model (Table 3) accounts for this characteristic by using three time periods: night, day/evening, and news gathering hours. Each of these time periods reflects the intensity of use of ENG systems during that period, allowing their use for interference studies.

As stated in the previous section, interference to low orbiting spacecraft of the space research service is assumed to occur in one ENG channel. Therefore, the time operational model characterizes only ENGs operating in one channel. The number of ENG systems operating per channel and the number of locations from which ENG systems are operating reflect the ENG activity during the three time periods.

The time operational model is based on the total number of minutes ENG systems are operating during a typical day in the United States [1]. The model also assumes that all the ENG systems are visible at spacecraft altitudes with no blockage due to buildings and other terrestrial features.

Although the intensity of ENG activity varies depending on the local time, the simplified model assumes simultaneous ENG activity from geographic locations throughout the United States. The largest television markets in the United States are used as the locations for the ENG systems in the model since ENG systems are used intensively in these markets.

Parameter	Basic Value
Transmitter power	10.8 dBW (12 W)
Antenna gain	22 dBi
Bandwidth	17 MHz
Antenna direction	
azimuth	uniform between 0 - 360° (0 - 2π radians)
elevation	0° 90% of locations uniform between 0 - 90° 10% of locations (0 - $\pi/2$ radians)

Table 2. ENG Parameters

Time Period	Hours per Day (time factor)	Number of Systems per Channel per Location	Number of Locations
Night	6 hours/day (0.25)	0	(no systems operating)
Day/evening	15 hours/day (0.625)	1	20 (largest television markets)
News gathering hours	3 hours/day (0.125)	2	50 (largest television markets)

Table 3. ENG Time Operational Model

7. Summary

A model describing ENG systems has been presented for use in studies to develop criteria to facilitate sharing between the space science services and ENG systems in the 2 025-2 110 MHz and 2 200-2 290 MHz bands. Emphasis has been placed on ENG operations in the 2 025-2 110 MHz band since ENG systems operate in the band in the United States. (The United States operates aeronautical telemetry systems in the mobile service in the companion band of. 2 200-2 290 MHz) The significant characteristics of the model are:

- a number of transportable and highly mobile services are provided by ENG systems;
- the predominate use of ENG systems is in urban areas;
- attenuation on Earth-to-space paths, particularly at low elevation angles, could be significant as a result of absorption and scattering by buildings, foliage and other vegetation;
- transmitter power ranges from as little as 100 mW up to 12 W;
- transmitting antenna gain ranges from isotropic up to about 25 dBi;
- higher transmitter powers are associated with higher transmitting antenna gain and lower transmitter powers are associated with lower transmitting antenna gain;
- ENG transmitters use frequency modulation;
- basic frequency plan employs 17 MHz channels spaced 17 MHz apart, except the first channel which is 18 MHz wide (i.e., 1 990-2 008 MHz);
- split channel operation is frequently used;
- the use of ENG systems is determined by local time;
- most intense use of ENG systems is in the 20 largest television markets where 2 simultaneous users per channel could occur during the 3 peak news gathering hours, dropping to 1 user per channel for the remainder of the day/evening hours;
- use of ENG systems in the 21st through 50th largest television markets is about 2 simultaneous users per channel during the 3 peak news gathering hours;
- little or no use of ENG systems for 6 hours during the late-night to early morning period; and,
- additional study is needed to incorporate the low elevation angle effects of buildings, foliage, and other vegetation into the model.

References

1. Cohen, Dr. Ed, *Television Auxiliary Frequencies Usage Surveys*, National Association of Broadcasters, 23 June 1989.